

The barometer on board the *El Estero* has been recently compared, and is apparently reliable, so the most unusual reading of 27.84 inches (corrected) is probably very nearly correct.

**American S. S. *El Valle*:**

10 a. m., 24th; position, latitude 26° N., longitude 86° 18' W.; barometer 29.69 inches; wind E., 9; rain. 7 p. m., 24th; position, latitude 25° 36' N., longitude 85° 30'; barometer 29.32 inches (lowest); wind N., 10; overcast. Wind shifted to fresh NE. gale at noon, then gradually to NNE. and N., whole gale. At 8 p. m. gradually decreased.

**Danzig S. S. *Baltic*:**

Gale began on the 24th, wind E. Lowest barometer 28.33 inches at 3 a. m. on the 24th, wind E., 12; position, latitude 24° N., longitude 85° 10' W. End on the 25th, wind S. Highest force 12, E.; shifts not given.

**American S. S. *Westland*:**

Gale began on the 23d, wind SE. Lowest barometer 29.48 inches at 11 p. m., on the 23d, wind SE., 11; position, latitude 25° N., longitude 81° 40' W. End on the 25th, wind N. Highest force 11; shifts SE.-E.-ENE.-NNE.-N.

**American S. S. *El Sol*:**

Twenty-fifth, overcast sky with heavy rain squalls and fresh east winds to strong east, south, and SSW. gales with heavy sea. Lowest barometer 29.52 inches at 3 p. m. At 5 p. m. barometer began to rise, and wind moderate. Midnight strong SW. winds; barometer 29.72 inches. Position at 7 p. m. on the 25th, latitude 25° 30' N., longitude 80° 02' W.; barometer 29.60 inches; wind S. by W., 8; rain.

**American S. S. *F. D. Asche*:**

Gale began on the 25th, wind ESE. Lowest barometer 29.27 inches at 2 p. m. on the 26th, wind SW.; position, latitude 27° 30' N., longitude 78° 30' W. End on the 27th, wind WNW. Highest force of wind 12, SE.; shifts SW.-SW. by W. Oct. 26, frequent passing ugly and very dark low clouds with heavy rain and violent wind. Also several waterspouts.

**American S. S. *Acme*:**

Gale began on the 25th. Lowest barometer 29.60 inches at 2 p. m. on the 25th; position, latitude 30° 35' N., longitude 79° 12' W. End on the 27th, wind E. Highest force 10, E.; shifts E.-NE.

**American S. S. *General W. C. Gorgas*:**

On the 26th at 7 p. m.; position, latitude, 29° 48' N., longitude 73° 52' W.; barometer 29.60 inches; wind E., 8; rain. On the 27th, 7 p. m., position, latitude 30° 06' N., longitude 73° W.; barometer 29.75 inches; wind, NE., 10; rain.

**British S. S. *Magellan*:**

Gale began on the 26th, wind, S. Lowest barometer 29.26 inches at 2 p. m., on the 27th, wind, SW., 11; position, latitude 27° 45' N., longitude 73° 11' W. End on the 28th. Highest force of wind 11, SW.; shifts, SW.-WSW.-W.-WNW.

**American S. S. *Aryan*:**

Gale began on the 27th, wind, SE. Lowest barometer 28.96 inches at 1 p. m., on the 27th, wind, ESE., 9; position, latitude 28° 20' N., longitude, 70° 30' W. End on the 28th, wind, ENE. Highest force 12; shifts, ESE.-E.-ENE.-NE.

**American S. S. *Saguache*:**

Gale began on the 28th, wind E. Lowest barometer 29.56 inches, wind E., 9; position, latitude 27° 14' N., longitude 64° W. End of gale on the 29th, wind N. Highest force 11; shifts E.-ENE.

On the 26th there was a Low central about 150 miles east of St. Johns, Newfoundland, that remained nearly stationary during the remainder of the month. It reached its greatest intensity on the 29th, and on that date the center was near St. Johns, where a barometer reading of 28.94 inches was recorded. According to press reports this was the most severe storm experienced in the vicinity of Newfoundland in over 60 years, 13 vessels being wrecked, while there were numerous other casualties on both land and sea. Charts XI to XVI show the conditions that existed from the 26th to the 31st, inclusive,

and will give an idea of the intensity and extent of this disturbance. Storm logs follow:

**Belgium S. S. *Kremlin*:**

Gale began on the 26th, wind SSE. Lowest barometer 28.53 inches at 9 a. m. on the 26th, wind WNW.; position, latitude 47° 04' N., longitude, 45° 05' W. End on the 30th, wind WNW. Highest force 10; NW.-SW.

**British S. S. *Mackinaw*:**

Gale began on the 27th, wind NNE. Lowest barometer 28.91 inches at 2 p. m. on the 29th, wind NNE., 11; position, latitude 43° 45' N., longitude 55° 02' W. End on the 31st, wind NNE. Highest force 12; shifts N.-NW.-W.

**British S. S. *Vasconia*:**

Gale began on the 28th, wind W. Lowest barometer 28.64 inches on the 29th, wind NNW., 11; position, latitude 43° 33' N., longitude 52° 38' W. End on the 31st. Highest force 11; shifts NW.-WNW.-N.

**British S. S. *Turcoman*:**

Gale began on the 28th, wind NNE. Lowest barometer 29.60 inches on the 29th, wind NNE.; position, latitude 52° N., longitude 54° 30' W. End on the 30th, wind NNE. Highest force 11; steady from NNE.

**Belgium S. S. *Gothland*:**

Gale began on the 31st, wind N. Lowest barometer 29.12 inches at 10 a. m. on the 31st; position, latitude 44° 25' N., longitude 49° 50' W. End on November 1, wind N. Highest force 9; shifts N.-NW.

From the 27th to the 31st a number of reports were received from vessels in the region between the Azores and the Bermudas that encountered winds of gale force, as shown by Charts XII to XVI, inclusive. Storm logs follow:

**British S. S. *Nubian*:**

Gale began on the 26th, wind SSW. Lowest barometer 29.56 inches at 3.45 a. m. on the 27th, wind NE.; position, latitude 32° 50' N., longitude 52° 05' W. End on the 28th, wind ENE. Highest force 8; shifts SSW.-WNW.-NE.

**British S. S. *Kabinga*:**

Gale began on the 28th, wind SSE. Lowest barometer 29.32 inches at midnight on the 30th, wind WSW., 10; position, latitude 36° 06' N., longitude 39° 45' W. End on November 1. Highest force 11; shifts W.-SW.-NW.

**American S. S. *Edgefield*:**

At 10 a. m. on the 31st, wind WNW., 8; barometer 29.53 inches, 1 p. m. wind W., 7; barometer 29.62 inches; position, latitude 37° 45' N., longitude 33° 20' W. 4 p. m. wind SSW., 6; barometer 29.66 inches. Shifts of wind very erratic, changing from one direction to another in a minute's time and blowing with equal force. Sea confused.

551.506 (265.2)  
NORTH PACIFIC OCEAN.

By F. G. TINGLEY.

October weather on the North Pacific Ocean was chiefly characterized by four disturbances of tropical origin<sup>1</sup> which moved northward one after another in different parts of the ocean. The first of these was the typhoon which appeared to the south of Guam Island on the 2d. This traveled in a northwesterly direction during the following three days and on the 6th and 7th recurved to the northeastward. On the 8th it was some 250 miles west of the Bonin Islands. Little is known regarding the intensity of this storm or of its history subsequent to the 8th.

The second disturbance formed near the Hawaiian Islands about the 5th, and during the next several days moved slowly northward toward the Gulf of Alaska, there merging with a depression which had advanced

<sup>1</sup> Late reports indicate that the last one of these storms may have been of extratropical origin. See article by Rev. José Coronas, S. J., on pp. 581-582.

eastward over the Aleutian Islands on the 7th. From the 8th to the 10th the combined depression was ill defined, but on the 11th it increased in energy and by the 12th covered the whole of the Gulf of Alaska, as well as near-by portions of the ocean. Between the 12th and 16th it remained nearly stationary as a fairly vigorous disturbance, causing moderate to fresh westerly gales along the eastern portion of the northern steamer lane. On the 17th it moved inland on the British Columbian coast and a fresh depression formed in the ocean to the northward of the Hawaiian Islands.

In connection with the latter depression an interesting development was reported by Capt. H. J. Satterly of the British S. S. *Adna*. At noon on the 17th the *Adna*, San Francisco for Kobe, was in latitude  $36^{\circ} 40' N.$ , longitude  $147^{\circ} 29' W.$ , barometer 29.32 inches, wind SSW. At 2:30 p. m. the barometer had fallen to 29.10 inches and the wind had backed to southerly, increasing to force 10-11. There was a very heavy, breaking southerly sea. At 3 p. m. the wind started to veer to westward, and at 4 p. m., according to Capt. Satterly, the disturbance suddenly blew out, the barometer standing at 29.04 inches. There was a very confused sea. After 4 p. m. the barometer rose quickly, and at 6:15 p. m. read 29.42 inches. After the passing of the disturbance the wind came down from the NW. in a heavy blast, later settling down to a moderate gale. Late on the previous day, states Capt. Satterly, the wind had twice in quick succession veered round the compass, and formations that looked like small whirlwinds were seen in various places traveling in a northeasterly direction. Capt. Satterly expressed the opinion, which subsequent developments appear to confirm, that these signs pointed to the formation of a small circular storm. The whole circumstance was not unlike the development on January 29, 1921, when a secondary depression formed near the coast of the United States and traveled northward, causing great destruction of valuable timber in the States of Oregon and Washington.<sup>2</sup>

The third disturbance appeared to the southwest of Midway Island on the 9th and by the evening of the 10th a moderate SW. gale was blowing at that place. The barometer read 29.62 inches, having fallen steadily since the evening of the 6th, when it stood at 30.18 inches. Capt. Geo. H. Piltz, of the American schooner *Flaurence Ward*, lying at Midway Island, reported that the barometer continued to fall until noon of the 11th, when it read 29.35 inches. At that hour a strong SSW. gale was blowing. By 4 p. m. of the 11th the wind had decreased to a moderate gale and the barometer was rising. This depression moved slowly east-northeastward without displaying much energy, and lost identity in the region south of Alaska.

The fourth and most important disturbance of the series had its origin still farther to the westward. The opinion that this storm was of tropical origin at first appeared to be confirmed by reports of a typhoon between Guam and the Bonin Islands from the 13th to 18th, but the presence of depressions to the north of Japan on the 16th-18th makes the case somewhat uncertain. The first vessel to become involved among those from which reports have been received was the American S. S. *West Nomentum*, Capt. R. N. Canghell, Observer H. A. Dunham, Portland for Yokohama. At midnight of the 19th-20th, when the *West Nomentum* was in latitude  $37^{\circ} 10' N.$ , longitude  $160^{\circ} E.$ , the barometer fell to 28.84 inches. The wind at this time was S., force 10, the highest experienced by this

vessel during the storm. The shifts of wind were SW., W., WNW.

The next reporting vessel to become involved was the British S. S. *Bessie Dollar*, Capt. J. Kerr, Observer M. Buchanan, Kobe for Vancouver. At 2 p. m. on the 20th, when in latitude  $45^{\circ} 12' N.$ , longitude  $160^{\circ} E.$ , the barometer fell to 28.90 inches. The wind at that time was northerly, force 8, the *Bessie Dollar* being on the northern side of the storm. Shifts of wind were N., NW., WNW.; highest force 8, N.

The vessels perhaps most heavily involved in this storm were the Japanese S. S. *Kashima Maru*, the American S. S. *Steel Voyager*, and the British S. S. *Tyndareus* and *Empress of Asia*. The first-named vessel, under command of Capt. K. Itsuno, observer H. Tanaka, was proceeding from Yokohama toward Seattle. According to the storm log of the vessel the gale began on the 20th, wind E., force 7; the lowest barometer recorded was 27.78 inches (approximately) at 3 a. m. of the 21st, in latitude  $48^{\circ} 05' N.$ , longitude  $171^{\circ} E.$ ; the highest force of wind was 12, SSW., which occurred at the time of lowest barometer. The storm ended for this vessel on the 22d, wind W., force 7.

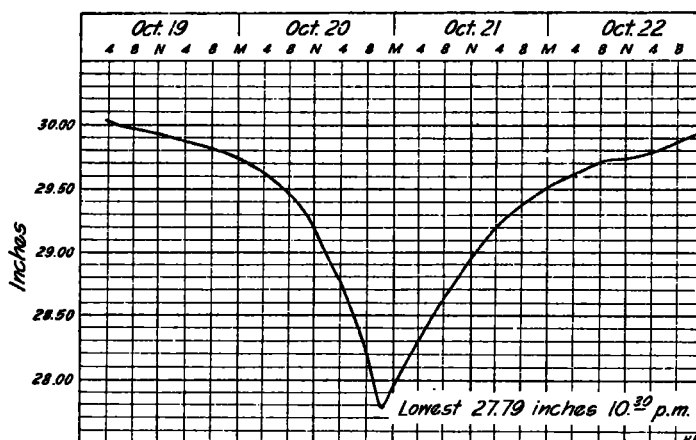


FIG. 1.—Fluctuation of barometer October 19-21, 1921, as observed on board the British S. S. *Tyndareus*.

Press reports sent out by radio from the *Kashima Maru* immediately after the storm quoted Capt. Itsuno to the effect that it was the worst in his 30 years' experience at sea. The waves were described as towering 60 feet above the bridge, thus having a height of 120 feet.

The *Steel Voyager*, bound from Kobe to Puget Sound ports, was nearest the storm center between 7 and 7:30 p. m. of the 20th, in latitude  $43^{\circ} N.$ , longitude  $172^{\circ} E.$ , at which time the barometer read 28.46 inches. Comparative readings made after the termination of the voyage indicate that a correction of  $-0.15$  inch should be applied. According to Mr. Raymond Leslie, second officer, the vessel was swept continuously by heavy seas. The force and shifts of wind are not known, but a chart of the probable storm track shows that the center passed some distance to the westward of the *Steel Voyager*.

The *Tyndareus*, Capt. C. A. Wilson, observer W. O. Griffiths, bound from Yokohama to Victoria, was somewhat to the southwestward of the *Kashima Maru*. The lowest barometer observed on board the *Tyndareus* was 27.79 inches. This occurred at 10:30 p. m. on the 20th, in latitude  $47^{\circ} N.$ , longitude  $169^{\circ} 18' E.$  The fluctuations of the barometer on the *Tyndareus* are shown in figure 1, the curve being constructed from the readings contained in a very complete report of the storm made by

<sup>2</sup> See MO. WEATHER REV., JANUARY, 1921, 49, 31.

Mr. Griffiths. The readings employed in constructing the curve have not been corrected for instrumental error, which, according to comparisons made at the end of the voyage, is  $-0.15$  inch.

The *Empress of Asia* was also heavily involved in the storm and recorded the lowest barometer in the group of four vessels named, 27.39 inches, corrected. This vessel, under command of Capt. L. D. Douglas, R. N. R., Observer J. F. Patrick, was bound from Vancouver to Yokohama. Her storm log is given herewith, as well as a reproduction of the barograph trace obtained, figure 2.

October 20. Noon position, latitude  $49^{\circ} 51' N.$ , longitude  $174^{\circ} 09' E.$ , barometer 29.81 inches, wind S., force 5, backing to ESE. at 1 p. m. and increasing in force. 4 p. m., barometer 29.29, temperature  $48^{\circ}$ , wind force 7, raining. 8 p. m., latitude  $49^{\circ} 05' N.$ , longitude  $170^{\circ} 34' E.$ , barometer 28.78, wind increasing to strong ESE, gale with high seas and continuous rain. 10 p. m., wind force 10, barometer 28.13, falling rapidly. Midnight, wind decreasing and backing to NE., barometer 27.53, temperature  $50^{\circ}$ .

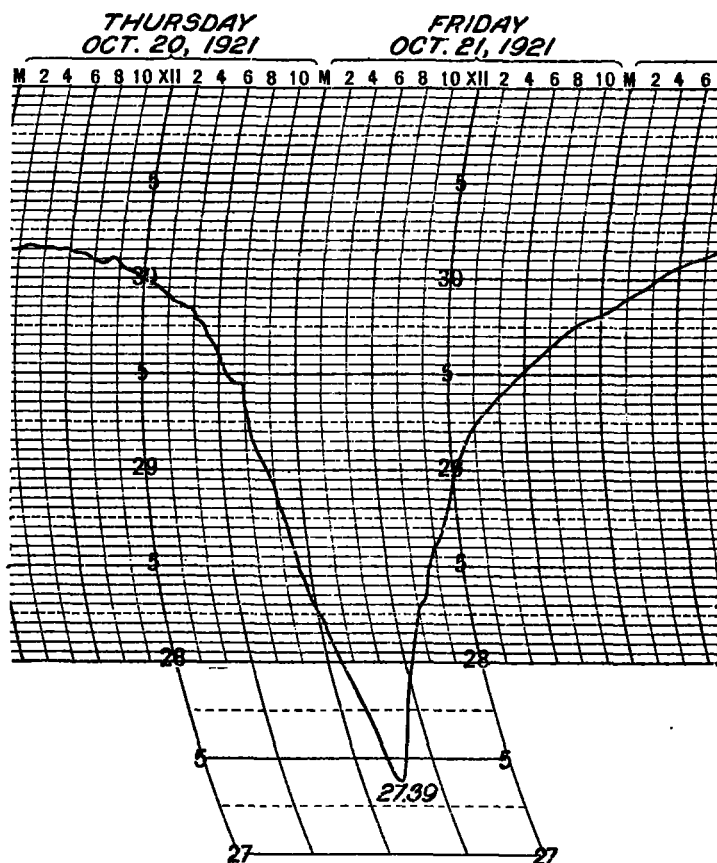


FIG. 2.—Barograph trace, October 20-21, 1921, British S. S. *Empress of Asia*.

October 21. 1 a. m., latitude  $48^{\circ} 33' N.$ , longitude  $168^{\circ} 03' E.$ , light variable winds with high SE. swell, barometer 27.48 (correction  $-0.09$  inch). 1:15 a. m., wind changed to NW., force 6, with high, confused sea. 2 a. m., barometer 27.50. 3 a. m., barometer 27.66, wind increasing to force 10, mountainous seas. Reduced speed, wind and sea brought 3 points on starboard bow. 4 a. m., latitude  $48^{\circ} 14' N.$ , longitude  $166^{\circ} 33' E.$ , wind increasing to hurricane force with very high, confused sea, barometer 27.91. 5 to 7 a. m., terrific squalls and high drift, being unable to see more than a ship's length, seas phenomenal. 8 a. m., latitude  $48^{\circ} 12' N.$ , longitude  $165^{\circ} 52' E.$ , barometer 28.60, patches of blue sky appearing. 8 to 11 a. m., wind continuing to force 12 with heavy hail squalls. Noon, latitude  $48^{\circ} 08' N.$ , longitude  $165^{\circ} 15' E.$ , weather moderating slightly to force 7 at midnight. Position at midnight, latitude  $46^{\circ} 58' N.$ , longitude  $162^{\circ} 01' E.$

This storm possessed at a high latitude the pressure characteristics of a tropical cyclone, in this respect resembling the West Indian hurricane of September 7-18, 1921, in the North Atlantic Ocean. It continued

its northeasterly movement to Bering Sea where, on the evening of the 21st, a barometer reading of 28.66 inches was recorded at St. Pauls, Pribilof Islands. On the following day it was central over the Alaskan Peninsula, very much diminished in energy.

Aside from the four storms mentioned no other disturbance of a general character prevailed during the month, so far as known. One of moderate extent and intensity, however, developed on the 9th off the southwest Mexican coast. It was experienced by the British S. S. *Mongolian Prince*, Capt. J. Halloway, Observer J. McLoughlin, Vancouver for Panama. The storm log of this vessel is as follows:

Gale began on the 9th, wind ESE.; heavy southerly swell; lowest barometer, 29.68 inches, occurred at 4 a. m., same date, in latitude  $17^{\circ} 15' N.$ , longitude  $101^{\circ} 51' W.$ ; gale ended on 10th; highest force of wind, 7, SE.; shifts ESE.-SE.

Pressure conditions at the island stations of Dutch Harbor, Honolulu, and Midway Island were not marked by any unusual fluctuations. For the month as a whole pressure was below normal by small amounts at all three stations.

#### NO TYPHOON IN THE PHILIPPINES DURING OCTOBER, 1921. ONLY THREE IN THE PACIFIC.

By JOSÉ CORONAS, S. J., Chief Meteorological Division.

[Weather Bureau, Manila, P. I., Nov. 4, 1921.]

There was not a single typhoon traversing the Philippines during last October; and even of the three typhoons that have been observed in the Pacific only one approached sufficiently near to influence slightly our weather in the archipelago. Hence the lack of rain reported generally from our stations, especially from those of the western and northern part of Luzon as can be seen in the following table:

Rainfall data for October, 1921.

Station.	Total.	Departure from normal.
	mm.	mm.
Surigao.....	231.3	- 16.4
Cebu.....	146.3	- 60.2
Hollo.....	146.4	-114.0
Legaspi.....	258.7	- 68.8
Batangas.....	110.3	- 37.6
Manila.....	37.4	-151.0
San Isidro.....	122.7	- 36.4
Iba.....	104.9	- 68.6
Ipagupan.....	97.0	- 99.8
Baguio.....	115.6	-271.5
San Fernando, La Union.....	2.0	-142.8
Vigan.....	2.5	-182.6
Tuguegarao.....	24.6	-227.5
Laong.....	4.6	-215.9
Aparri.....	190.8	-107.1

The first Pacific typhoon was formed on 27th to 28th of September near longitude  $130^{\circ} E.$  and latitude  $10^{\circ} N.$ ; it moved practically to the north until the 30th when it recurved northeastward, probably filling up on the 2d or 3d of October near longitude  $135^{\circ} E.$  and latitude  $20^{\circ} N.$

The second typhoon formed on October 1 to 2 over the western Carolines in about longitude  $145^{\circ} E.$  and latitude  $8^{\circ} N.$  It moved northwestward, passing about halfway between Guam and Yap on the 3d. On the 6th the typhoon began to recurve northeastward near longitude  $135^{\circ} E.$  and latitude  $20^{\circ} N.$  The weather maps of Tokyo show this typhoon moving north-northeast near the eastern coast of Japan on the 10th and 11th.